



# THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of JKUAT)

*Faculty of Engineering and Technology*

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

UNIVERSITY EXAMINATION FOR DEGREE IN  
BACHELOR OF TECHNOLOGY IN INFORMATION & COMMUNICATION  
TECHNOLOGY (BTech. ICT- 11M2)

EIT 4214: COMPUTER GRAPHICS

END OF SEMESTER II EXAMINATION

SERIES: DECEMBER 2011

TIME: 2 HOURS

## **Instructions to Candidates:**

You should have the following for this examination

- *Answer Booklet*

This paper consist of **FIVE** questions in **TWO** sections **A & B**

Answer question **ONE (COMPULSORY)** and any other **TWO** questions

Maximum marks for each part of a question are as shown

This paper consists of **THREE** printed pages

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## **SECTION A (Compulsory)**

### **Question 1 (30 marks)**

- a) Define the term “computer graphics” [2 marks]
- b) Outline the role played by OpenGL in computer graphics [3 marks]
- c) Explain the following open GL terms [3 marks]
- FLTK
  - GLUT
  - BOOST
- d) Describe using a diagram the construction and operation of a colored CRT monitor [5 marks]
- e) (i) Define the term polygon clipping [2 marks]
- (ii) Write a Cohen–Sutherland clipping algorithm a line within a viewport [5 marks]
- f) Give **TWO** characteristics of each of the following display devices

- i. Plasma
  - ii. LCDs
  - iii. LEDs
- [6 marks]

- g) Define the following terms
- i. Color model
  - ii. Pixel
  - iii. Vector graphic
  - iv. Raster image
  - v. Virtual reality environment
- [5 marks]

- h) List **FOUR** applications of computer graphics in industry
- [4 marks]

**SECTION B (Attempt any TWO questions)**

**QUESTION 2 (20 marks)**

- a) Explain the OpenGL rendering pipeline using a diagram
- [4 marks]
- b) Sketch **FOUR** types of OpenGL 3D primitives
- [2 marks]
- c) Illustrate the following computer graphics objects
- i. Bezier
  - ii. Bezieregon
  - iii. Polygon
  - iv. Wireframe
- [8 marks]
- d) Write the Bresenham line drawing algorithm
- [6 marks]

**QUESTION 3 (20 marks)**

- a) Identify **THREE** standard computer graphics formats that are synonymous with the World Wide Web
- [3 marks]
- b) Distinguish between the RGB color model and the CMYK model clearly stating where each may be used
- [5 marks]
- c) Differentiate with diagrams the following types of camera views
- [6 marks]
- i. One point perspective
  - ii. Two point perspective
  - iii. Isometric view
- [6 marks]

**QUESTION 4(20 marks)**

- a) Define the following terms
- i. Euclidean space
  - ii. Parametric surface
  - iii. computer aided design
- [6 marks]
- b) Outline **FOUR** advantages of using a CAD program over manual drawing
- [4 marks]
- c) Describe the following computer graphics transformation techniques
- i. translation

- ii. rotation
- iii. scaling
- iv. reflection
- v. shear

[5 marks]

d) Describe with a diagram the construction and operation of a cathode ray tube [5 marks]

### **QUESTION 5(20 marks) CASE**

**Rendering** is the process of generating an image from a [model](#) (or models in what collectively could be called a *scene* file), by means of computer programs. A scene file contains objects in a strictly defined language or data structure; it would contain geometry, viewpoint, [texture](#), [lighting](#), and [shading](#) information as a description of the virtual scene.

The data contained in the scene file is then passed to a rendering program to be processed and output to a [digital image](#) or [raster graphics](#) image file. The term "rendering" may be by analogy with an "artist's rendering" of a scene. Though the technical details of rendering methods vary, the general challenges to overcome in producing a 2D image from a 3D representation stored in a scene file are outlined as the [graphics pipeline](#) along a rendering device, such as a [GPU](#)

Many rendering algorithms have been researched, and software used for rendering may employ a number of different techniques to obtain a final image. The main ones include [rasterization](#), [scanline rendering](#), [ray tracing](#) and [radiosity](#)

a) Explain the following rendering terms

- i. [texture-mapping](#)
- ii. [bump-mapping](#)
- iii. [refraction](#)
- iv. [diffraction](#)
- v. [motion blur](#)
- vi. photorealistic

[12 marks]

b) Outline the following rendering techniques

- i. rasterization
- ii. scanline rendering
- iii. ray tracing
- iv. radiosity

[8 marks]